Difference in marine communities in the Channel Islands marine reserves and surrounding waters

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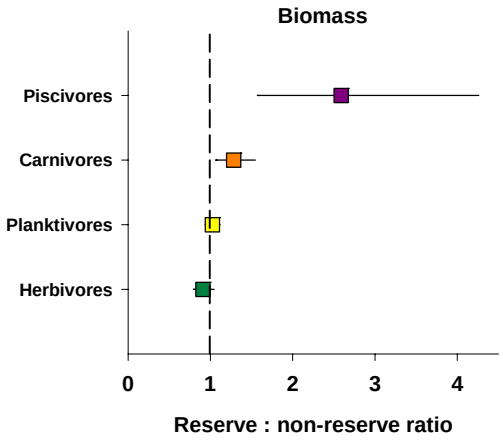
Scientists from PISCO and the Channel Islands National Park used SCUBA surveys to study kelp forest communities inside and outside marine reserves at the Channel Islands. Changes in these communities often take more time (decades) to occur than changes in abundance or size of particular species. Changes in communities require time for growth, reproduction, input of new individuals, competition between species, and predator-prey interactions.

Key findings:

- The species composition of marine communities in the Channel Islands is **strongly influenced by geography**. Extreme differences in the environment over a short distance (less than 100 km) result in different types of communities in the west channel (San Miguel and Santa Rosa islands) and east channel (Anacapa and Santa Barbara islands). To assess the effects of reserves, these geographic differences in communities must be considered.

- Invertebrate and fish communities in long-standing marine reserves (established more than 20 years ago) are different than in areas open to fishing. For example, the small marine reserve at Anacapa Island, established in 1978, supports **higher abundances** of California spiny lobster, rock scallops, and sea cucumbers, and a more stable kelp forest.



Fish biomass is plotted as the ratio of biomass in reserves relative to fished areas nearby (non-reserves). Biomass is higher in reserves if the ratio is greater than 1. Biomass is higher outside the reserves if the ratio is less than 1.

- State marine reserves, established at the Channel Islands in 2003, have **more different kinds of fish and greater total fish biomass** (weight) than fished areas nearby. Higher biomass of predatory fish accounts for the difference in biomass between reserves and fished areas. Predatory fish are often targeted by fishing and, therefore, are likely to benefit from protection in reserves.

- **Piscivore biomass is 2.6 times greater and carnivore biomass is 1.3 times greater in reserves** as compared to fished areas, while there is no difference in the biomass of herbivores or planktivores (see graph, left).

- Across the Channel Islands, urchins are less abundant and kelp more plentiful at sites with more urchin predators, such as California sheephead (fish). Important ecosystem changes leading to **more productive and stable kelp forests** can occur when fishing pressure is reduced on these key predators.